

and who recover quickly with few side effects should be more likely to be discharged if their injuries are of the same severity as those given morphine. The authors may be right in suggesting that this trend will disappear in larger studies.

The message from the paper is clear. Clinical evidence from other settings has shown that ketorolac and morphine are equivalent in relieving pain, but there is a distinct benefit favouring ketorolac in terms of side effects. This was not enough to change clinical practice, probably because of the cost of the drug. This latest evidence that the costs and benefits are also likely to favour ketorolac—with the attendant advantages in efficiency, quality of care, and patient satisfaction—should encourage emergency and primary care physicians to use titrated intravenous ketorolac for severe pain in isolated limb injuries. Given its previously reported efficacy as an analgesic for other conditions in the emergency department, the accumulating weight of evidence suggests that intravenous ketorolac will become the analgesic of choice for many emergencies.

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The importance of injecting vaccines into muscle

Different patients need different needle sizes

Most vaccines should be given via the intramuscular route into the deltoid or the antero-lateral aspect of the thigh. This optimises the immunogenicity of the vaccine and minimises adverse reactions at the injection site. Recent studies have highlighted the importance of administering vaccines correctly.¹⁻³ Clinical practice needs to reflect considerations about the right length and gauge of needles used to ensure that those vaccinated get the immunological benefit of the vaccines without local side effects.

Injecting a vaccine into the layer of subcutaneous fat, where poor vascularity may result in slow mobilisation and processing of antigen, is a cause of vaccine failure—for example in hepatitis B,² rabies, and influenza vaccines.³ Compared with intramuscular administration, subcutaneous injection of hepatitis B vaccine leads to significantly lower seroconversion rates and more rapid decay of antibody response.¹

Traditionally the buttocks were thought to be an appropriate site for vaccination, but the layers of fat do not contain the appropriate cells that are necessary to initiate the immune response (phagocytic or antigen-presenting cells). The antigen may also take longer to reach the circulation after being deposited in fat, leading to a delay in processing by macrophages and eventually presentation to the T and B cells that are involved in the immune response. In addition, antigens may be denatured by enzymes if they remain in fat for hours or days. The importance of these factors is supported by the findings that thicker skinfolds are associated with a lowered antibody response to vaccines.^{1,2}

Serious reactions to intramuscular injections are rare; in one series of 26 294 adults, of whom 46% had received at least one intramuscular injection, only 48

(0.4%) had a local adverse effect.⁴ However, subcutaneous injections can cause abscesses and granulomas.^{1,5,6} Muscle is probably spared the harmful effects of substances injected into it because of its abundant blood supply.⁵ Adipose tissue, having much poorer drainage channels, retains injected material for much longer and is therefore also more susceptible to its adverse effects.⁵ In the case of vaccines in which the antigen is adsorbed to an aluminium salt adjuvant—such as those for hepatitis A, hepatitis B, and diphtheria, tetanus, and pertussis vaccines—the intramuscular route is strongly preferred because superficial administration leads to an increased incidence of local reactions such as irritation, inflammation, granuloma formation, and necrosis.^{2,7,8}

The injection technique and needle size both determine how deep a substance is injected. Injection technique involves stretching the skin flat before inserting the needle or pinching a fold of skin before injection, which may necessitate the use of longer needles. To make sure the needle reaches the muscle and that vaccine does not seep into subcutaneous tissue the decision on the size of the needle and injection site should be made individually for each person. It should also be based on the person's age, the volume of material to be administered, and the size of the muscle.⁹

In a recent study, the thickness of the fat pad above the deltoid muscle of the upper arm was measured in 220 adults (healthcare workers presenting for hepatitis B immunisation) using high frequency ultrasonography.¹ A wide variation exists in thickness of the deltoid fat pad, with women having significantly more subcutaneous fat than men. A standard 5/8 inch (16mm) needle would not have achieved sufficient penetration for true deltoid intramuscular injection in

17% of men and nearly 50% of women in the study population.¹ For men weighing 59–118 kg and women of 60–90 kg it may be safer to use a 1 inch (25mm) needle. A woman over 90 kg may need a 1.5 inch (38mm) needle.

Healthcare professionals may hesitate to use longer needles on the grounds that they are likely to cause the patient more discomfort. However, skeletal muscle has a poor supply of pain fibres compared with skin and subcutaneous tissue.¹⁰

Consideration should be given to needle gauge.¹¹ A wider bore needle ensures that the vaccine is dissipated over a wider area, thus reducing the risk of localised redness and swelling.¹²

A standard size of needle will not guarantee successful intramuscular injection in all people. When intramuscular vaccine administration is needed to ensure optimal immunogenicity and minimise local reactions, a selection of non-fixed needles (pre-filled syringes that may be provided with a needle fixed on the barrel) should be available to allow healthcare professionals to select a length and gauge of needle appropriate to each patient.

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Barrett's oesophagus: the continuing conundrum

Surveillance should be confined to the surgically fit

In 1950 Barrett wrote a treatise to clarify confusion over oesophagitis which “connote[s] one thing to some people and something quite different to others.”¹ He described gastric mucosa extending into the tubular oesophagus as the result of a congenitally shortened oesophagus. The presence of columnar lined epithelium in the oesophagus is now referred to as Barrett's oesophagus. It is associated with chronic gastro-oesophageal reflux disease and an increased risk of oesophageal adenocarcinoma.² Quantifying this risk, and the best methods for early diagnosis, are still the subjects of considerable debate.

Endoscopically the distal end of the pearly white oesophagus is readily distinguished from the salmon red of the proximal stomach: the so called “Z line” or squamocolumnar junction. However, the location of the Z line may be difficult to identify in cases of intense inflammation, hiatal hernia, and stricture patients with oesophagitis. Extension of the Z line proximally—representing columnar replacement of the squamous epithelium of the distal oesophagus (Barrett's oesophagus)—is seen in 5–15% of patients with peptic oesophagitis.² Historically one point of confusion has been whether a minimal length of columnar metaplasia is needed to qualify for the diagnosis of Barrett's oesophagus: is it >2 cm, >3 cm, or >5 cm? In part, these arbitrary criteria were established to avoid “false positive” biopsies of intestinal metaplasia which often occur in the gastric cardia. The requirement of a minimum length to establish Barrett's oesophagus has been abandoned. Histologically, the columnar based epithe-

lium can be one of three types: gastric fundic gland, junctional type epithelium with cardiac mucous glands, or a distinct type of columnar metaplasia called specialised columnar (intestinal) epithelium.³ Only patients who have the specialised columnar epithelium are at an increased risk of cancer and should be considered for endoscopic surveillance.

About 10% of patients who have Barrett's oesophagus at the time of the initial endoscopic examination have coexistent oesophageal adenocarcinoma.^{4–5} The incidence of oesophageal adenocarcinoma has rapidly increased over the past two decades in Western Europe and the United States.⁶ Unfortunately, the 5 year survival rate is 11%. The risk factors for this cancer are longstanding gastro-oesophageal reflux disease, the presence of Barrett's specialised columnar epithelium, male sex, and white race.^{6–7} In a case-control study Lagergren et al showed that a greater risk of oesophageal adenocarcinoma was associated with more frequent, more severe, and longer lasting symptoms of acid reflux.⁷

It is difficult to know how to avoid the dismal prognosis of advanced cancer in patients with Barrett's oesophagus. Earlier reports from prospective studies showed that about one adenocarcinoma developed for every 100 patient years, representing a 30-fold to 125-fold increase in the risk of cancer compared with the general population.^{2–8} It is also believed that in patients with Barrett's oesophagus the development of adenocarcinoma is preceded by a continuum of dysplasia, from low to high grade, that can be readily identified by

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